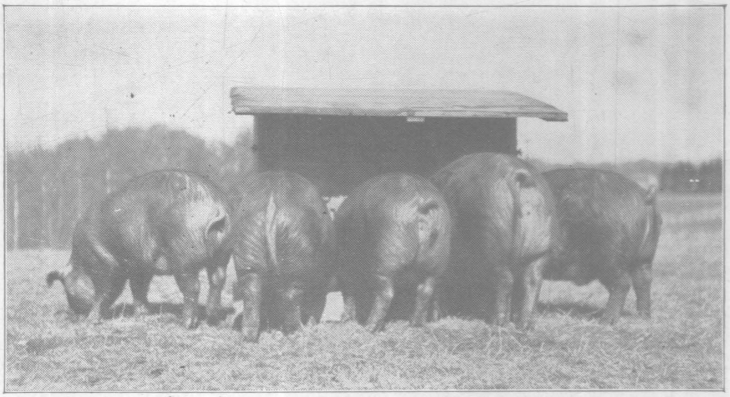
SELF-FEEDING SWINE

OHIO
Agricultural Experiment Station

WOOSTER, OHIO, U. S. A., FEBRUARY, 1922

BULLETIN 355



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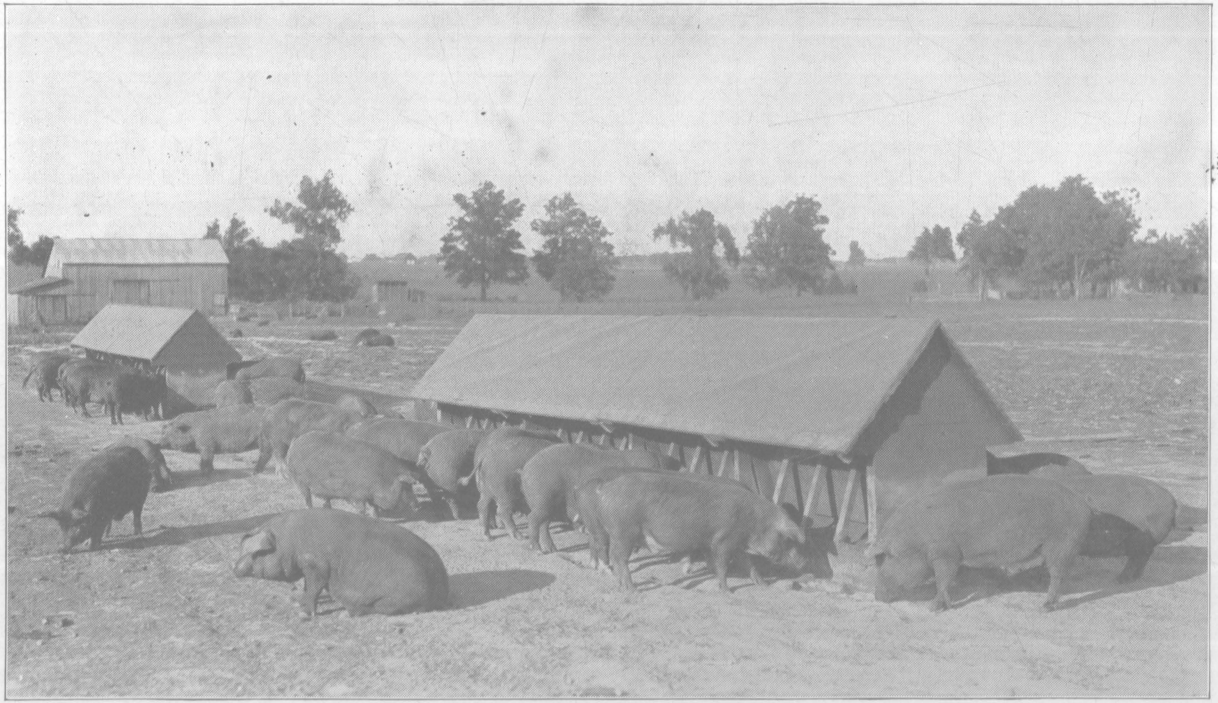

Self-feeders in use in practical production

BULLETIN
OF THE
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NUMBER 355 FEBRUARY, 1922

SELF-FEEDING SWINE

W. L. ROBISON

Within recent years the use of the self-feeder as a possible means of improving the methods of swine feeding has received much attention. Probably more publicity in the same length of time has been given to self-feeding than to any other one problem bearing on pork production or the feeding of hogs. Many adherents have made enthusiastic claims for the self-feeder, some even going so far as to maintain unqualifiedly that the self-feeding system is advantageous in every respect.

The experiments herein reported were planned and conducted in response to the numerous demands for information on the subject. At least the more obvious deductions to be drawn from the results secured in the tests are pointed out and some of the possibilities and limitations of self-feeding are also discussed.

COMPARISONS OF SELF AND HAND FEEDING IN DRY LOT

EXPERIMENT I.

In Experiment I, which was conducted to compare self and hand feeding in dry lot, four groups of purebred Tamworth pigs were used. One group was self-fed corn and tankage, another hand-fed the same feeds, a third self-fed corn, middlings and tankage and the fourth hand-fed a ration composed of these three feeds. The proportions of feed used in the rations given the hand-fed pigs are shown in Table I. The feeds for the self-fed lots were placed in separate compartments of the feeders so that the pigs could take whatever amounts of each they might select. At the beginning of the experiment the pigs averaged 72 pounds in weight. Table I gives a summary of the results for each lot from the beginning of the test until an average weight of approximately 228 pounds was reached.

An average of 12.5 pounds of corn to each pound of tankage was taken by the pigs self-fed the two feeds. The other self-fed lot consumed 11.4 pounds of corn to 2.8 pounds of middlings to 1 pound of tankage which was a larger proportion of tankage and less middlings than was used in the hand-fed ration containing middlings. With the exception of the lot hand-fed corn and tankage the difference in the rates of gain was less than 1 percent.

TABLE I.—EXPERIMENT I: Comparison of Self and Hand Feeding in Dry Lot.

Summary to a weight of 228 pounds				
Test was started December 8, 1914	1 Self-fed corn and tankage separately	2 Self-fed corn, middlings and tankage separately	3 Hand-fed corn, 9; tankage, 1	4 Hand-fed corn, 15; middlings, 4; tankage, 1
Time required.....days.	105	105	112	105
Pigs per lot.....number.	6	7	6	7
Average initial weight.....pounds.	71.7	72.7	71.6	71.9
Average final weight.....pounds.	227.5	228.9	227.7	227.2
Total gain.....pounds.	934.5	1,093.	936.5	1,087.
Average daily gain.....pounds.	1.483	1.487	1.394	1.479
Feed: corn.....pounds.	3,480.4	3,473.75	3,643.2	3,357.
middlings.....pounds.	.....	854.75	.....	898.65
tankage.....pounds.	277.5	306.	404.8	224.10
total.....pounds.	3,757.9	4,634.5	4,048.	4,479.75
Daily feed per pig: corn.....pounds.	5.524	4.726	5.422	4.567
middlings.....pounds.	.....	1.163	.....	1.223
tankage.....pounds.	.441	.416	.602	.305
total.....pounds.	5.965	6.305	6.024	6.095
Daily feed per 100 lbs. weight....pounds.	3.987	4.182	4.026	4.075
Feed per 100 pounds gain: corn..pounds.	372.434	317.818	389.023	308.832
middlings.....pounds.	.....	78.202	.....	82.673
tankage.....pounds.	29.695	27.996	43.225	20.616
total.....pounds.	402.129	424.016	432.248	412.121
Parts corn and tankage or corn, middlings and tankage.....	12.5:1	11.4:2.8:1	9:1	15:4:1

In the case of self-feeding, the addition of middlings to corn and tankage increased the feed requirement per unit of gain without materially affecting the rate of growth, and in other experiments as well in which pigs of like weight were used, the addition of middlings to corn and tankage failed to improve the ration. From these results it would appear that the relatively high feed consumption per unit of gain for the lot hand-fed corn and tankage is not representative of the comparative results to be expected from hand-feeding rations of corn and tankage and of corn, middlings and tankage or from self and hand feeding rations of corn and tankage.

EXPERIMENT II.

A second test comparing self and hand feeding in dry lot was conducted the following winter. Twelve purebred Tamworth pigs between 23 and 24 weeks of age and averaging 116.5 pounds in weight were divided into two groups and used in the experiment.

One lot was self-fed corn and tankage separately while the other was hand-fed a mixture consisting of 12 parts of corn to 1 part of tankage by weight. A record of the results for each lot from the beginning of the test until an average weight of approximately 200 pounds was reached is presented in Table II.

TABLE II.—EXPERIMENT II: Comparison of Self and Hand Feeding in Dry Lot.

Summary to a weight of approximately 200 pounds			
Test was started February 3, 1916 Six pigs per lot		Self-fed corn and tankage separately	Hand-fed corn, 12; tankage, 1
Time required	days	49	56
Average initial weight	pounds	116.6	116.5
Average final weight	pounds	197.	203.3
Total gain	pounds	482.5	521.
Average daily gain	pounds	1.641	1.551
Feed; corn	pounds	1,795.	1,932.923
tankage	pounds	155.5	161.077
total	pounds	1,950.5	2 094.
Daily feed per pig: corn	pounds	6.105	5.753
tankage	pounds	.529	.479
total	pounds	6.634	6.232
Daily feed per 100 pounds weight	pounds	4.231	3.897
Feed per 100 pounds gain: corn	pounds	372.021	371.002
tankage	pounds	32.228	30.917
total	pounds	404.249	401.919
Parts corn and tankage		11.54:1	12:1

While the hand-fed group gained only 94.5 percent as rapidly as the self-fed lot they consumed slightly less feed for each unit of gain produced. There was not a great deal of difference in the proportion of tankage supplied on the one hand and selected by the pigs on the other.

A comparison of self and hand feeding in dry lot in which rations of corn and tankage were used is reported in Table II of Bulletin 343. Two of the pigs in the hand-fed lot of that experiment did so poorly they were taken out at the end of the twelfth week. While on the test they gained at the rate of three-tenths of a pound a day or only 31.25 percent as rapidly as did the other three in the same lot until the time the two were removed. Very likely, too, their increase in live weight from a given amount of feed was correspondingly low. During the same period the two slowest-gaining self-fed pigs gained 75.73 percent as much daily a head as did the top three in their lot. Since the relative performance of the self and hand-fed groups was doubtless not what it would have been had the two pigs responded normally the records of the test are omitted from the present reports comparing self and hand feeding.

EXPERIMENT III.

Purebred Duroc-Jersey pigs which had been fed and treated alike previous to the beginning of the experiment and which, with the exception of one pig 18 days younger, were from 14 to 15 weeks of age at the time the test was started were used in Experiment III, comparing self and hand feeding corn and tankage in dry lot. One group was given access to shelled corn and tankage placed in separate compartments of the feeder while the other was hand-fed all the shelled corn it would clean up readily twice daily and given an allowance of thirty-six hundredths of a pound of tankage daily a head. Table III gives a summary of the results secured.

TABLE III.—EXPERIMENT III: Comparison of Self and Hand Feeding in Dry Lot.

Summary to a weight of 244 pounds

Test was started December 17, 1919 Five pigs per lot		Self-fed corn and tankage separately	Hand-fed corn and tankage
Time required	days..	154	168
Initial weight per pig	pounds..	43.6	44.4
Final weight per pig	pounds..	243.4	244.
Total gain	pounds..	999.	998.
Average daily gain	pounds..	1.297	1.188
Feed: corn	pounds..	3,816.5	3,607.5
tankage	pounds..	326.5	302.4
total	pounds..	4,143.	3,909.9
Daily feed per pig: corn	pounds..	4.957	4.295
tankage	pounds..	.424	.360
total	pounds..	5.381	4.655
Daily feed per 100 pounds weight	pounds..	3.749	3.228
Feed per 100 pounds gain: corn	pounds..	382.032	361.473
tankage	pounds.	32.683	30.301
total	pounds..	414.715	391.774
Parts corn and tankage consumed	pounds..	11.69:1	11.93:1

The pigs in each lot were carried to an average final weight of approximately 245 pounds. Periods of 154 and 168 days were required for the self and hand-fed lots respectively to make a gain of 200 pounds a head. An average of 1 part of tankage to 11.7 parts of corn by weight was consumed by the self-fed pigs. The tankage allowed the hand-fed lot amounted to 1 pound for every 11.9 pounds of corn taken by them. Although the self-fed pigs made a gain of 200 pounds a head in 2 weeks less time than the hand-fed lot they consumed 2.38 pounds more tankage and 20.56 pounds more corn per 100 pounds of gain or a total of 5.86 percent more feed for each unit of gain produced.

EXPERIMENT IV.

A further comparison of self and hand feeding was made in the experiment reported in Table IV. Each lot consisted of six purebred Duroc-Jersey pigs ranging from 12 to 15 weeks of age at the

beginning of the test. The self-fed pigs had access to ground corn and tankage at all times so that they could take whatever amounts of either they might care for. The hand-fed ration was composed of 12 parts of ground corn to 1 part of tankage by weight. Both lots were confined to small pens and had no green feed of any kind. The records for the two lots are summarized to the time when their weekly weights were nearest an average of 245 pounds a head.

TABLE IV.—EXPERIMENT IV: Comparison of Self and Hand Feeding in Dry Lot.

Summary to a weight of approximately 245 pounds		
Test was started June 21, 1920 Six pigs per lot	Self-fed corn and tankage separately	Hand-fed corn, 12; tankage, 1
Time required ..... days..	105	133
Initial weight per pig ..... pounds..	65.75	66.33
Final weight per pig ..... pounds..	243.83	249.58
Total gain ..... pounds..	1,068.5	1,099.5
Average daily gain ..... pounds..	**1.696**	**1.378**
Feed: corn ..... pounds..	4,026.5	3,806.769
tankage ..... pounds..	194.5	317.231
total ..... pounds..	4,221.	4,124.
Daily feed per pig: corn ..... pounds..	6.391	4.770
tankage ..... pounds..	.309	.398
total ..... pounds..	6.700	5.168
Daily feed per 100 pounds weight ..... pounds..	4.328	3.272
Feed per 100 pounds gain: corn ..... pounds..	**376.837**	**346.227**
tankage ..... pounds..	**18.203**	**28.852**
total ..... pounds..	**395.040**	**375.079**
Parts corn and tankage consumed	20.7:1	12:1

Although hand-feeding resulted in producing gains only 81.25 percent as rapidly as self-feeding, so that it took the hand-fed pigs 25 days longer to make a gain of 180 pounds a head, it affected a saving in feed of 5.1 percent for each unit of gain produced. If the smaller proportion of tankage taken by the self-fed pigs was partially or wholly responsible for the higher feed requirement per 100 pounds of gain this would be an instance in which the pigs failed to take the feeds before them in the proportion most nearly meeting their physiological needs, but whether allowing them to choose the percentages of the two feeds for themselves or whether giving them their individual freedom with regard to when they should eat and how much they should take was responsible for the difference in the gains made from a given amount of feed, is not known.

SUMMARY OF DRY LOT SELF AND HAND FEEDING EXPERIMENTS

Table V gives a general summary of the experiments comparing self and hand feeding reported in the preceding tables. Besides the data of the tests in which rations of corn and tankage

were fed the figures include the results of the comparison in Experiment I in which rations of corn, middlings and tankage were used. Self-feeding was instrumental in getting the pigs to take a larger amount of feed daily for each unit of their weight than was eaten by the hand-fed pigs. Naturally the higher feed consumption resulted in more rapid growth. The average difference secured in the rapidity of gains would enable self-fed pigs to be marketed 11 days earlier than hand-fed pigs if both were carried from an initial weight of 40 to a final weight of 215 pounds a head. The self-fed pigs took a slightly smaller average proportion of tankage than was used in the hand-fed rations. Although the difference was not great, the hand-fed pigs required fewer pounds of feed on the average for each unit of gain produced than was consumed by those that were allowed to feed themselves.

TABLE V.—Summary of Tests Directly Comparing Self and Hand Feeding in Dry Lot.

	Self-fed corn and tankage	Hand-fed corn and tankage
Number of lots	5	5
Number of pigs	30	30
Average time required to gain 175 pounds....days..	117	128
Initial weight per pig....pounds..	75.0	75.1
Final weight per pig....pounds..	227.6	229.8
Total gain....pounds..	4,577.5	4,642.
Average daily gain....pounds..	1.496	1.373
Feed: corn*....pounds..	17,446.9	17,246.042
tankage....pounds..	1,260.	1,409.608
total....pounds..	18,706.9	18,655.650
Daily feed per pig: corn....pounds..	5.703	5.101
tankage....pounds..	.412	.417
total....pounds..	6.115	5.518
Daily feed per 100 pounds weight....pounds..	4.041	3.620
Feed per 100 pounds gain: corn....pounds..	381.145	371.522
tankage....pounds..	27.526	30.366
total....pounds.	408.671	401.888
Parts corn and tankage consumed	13.85:1	12.24:1

*Includes 854.75 and 898.65 pounds of middlings used respectively by the self and hand fed lots in one of the experiments.

A summary of all the experiments in which pigs having no forage were self-fed rations of corn and tankage is presented in Table VI and compared with a similar summary which includes the records for all of the hand-fed groups of pigs, since and including 1913, that have been confined in dry lots and fed rations of corn and tankage for a period of at least 8 weeks, and that weighed under 65 pounds at the beginning or over 200 pounds at the close. While all of the tests included were not conducted primarily for studying the respective merits of self and hand feeding in dry lot and do not necessarily represent direct comparisons, the numbers involved are

sufficiently large to make the figures of some worth for that purpose. Since the relationships revealed are the same in every particular as those shown by the summary of the experiments directly comparing self and hand feeding they strengthen the belief that the relative results shown are indicative of what may be expected as a rule from the two plans of feeding.

TABLE VI.—General Summary of Self and Hand Feeding in Dry Lot.

	Self-fed corn and tankage	Hand-fed corn and tankage
Number of lots	12	21
Number of pigs	64*	109†
Average time required to gain 175 pounds....days..	126	137
Initial weight per pig....pounds..	64.6	59.5
Final weight per pig....pounds..	215.7	215.0
Total gain....pounds..	9,531.5	15,536.
Average daily gain....pounds..	1.394	1.276
Feed: corn....pounds..	35,722.9	55,257.021
tankage....pounds..	2,905.7	5,663.419
total....pounds..	38,628.6	60,920.440
Daily feed per pig; corn....pounds..	5.226	4.537
tankage....pounds..	.425	.465
total....pounds..	5.651	5.002
Daily feed per 100 pounds weight....pounds	4.031	3.644
Feed per 100 pounds gain: corn....pounds..	374.788	355.671
tankage....pounds..	30.485	36.453
total....pounds..	405.273	392.124
Parts corn and tankage....pounds..	12.29:1	9.76:1

*One pig taken out during the experiment. †Eleven pigs taken out during the experiments.

Since a larger average percentage of tankage was used in the hand-fed rations than was supplied the hand-fed lots in the tests summarized in Table V, the difference in the proportion of tankage consumed by the pigs fed in the two ways is greater than in the other summary but the difference in the amount of feed consumed for each 100 pounds of gain in favor of hand-feeding is also greater.

As a rule self-fed pigs in dry lot eat more feed than similar pigs under the same conditions that are hand-fed can be induced to consume. The greater feed consumption results in a higher rate of gain and makes it possible to market the pigs a week or two earlier than they could be if they were hand-fed. Hand-feeding on the other hand has a compensating feature in that slightly greater gains are produced from a given amount of feed.

COMPARISONS OF SELF AND HAND FEEDING ON FORAGE

SELF AND HAND FEEDING ON CLOVER

EXPERIMENT V

Experiment V was conducted to compare self and hand feeding on clover pasture and also to compare a ration of corn and tankage with one of corn alone when both were self-fed. Thirty purebred

Duroc-Jersey weanling pigs ranging from 61 to 67 days of age when the experiment was started were used. Each plot of clover contained an area of one-half acre. Ten pigs were used to the lot. One group was self-fed corn alone, another allowed access to corn and tankage at all times kept in separate compartments of a self-feeder and the third hand-fed a ration consisting of 19 parts of corn to 1 of tankage by weight and given all they would clean up readily twice daily. Shelled corn was used. Table VII gives the results secured during a period of 18 weeks.

TABLE VII.—EXPERIMENT V: Self and Hand Feeding on Clover Pasture.

May 30 to October 3, 1916 Ten pigs per lot	Corn alone self-fed	Corn and tankage, self-fed	Corn, 19; tankage, 1, hand-fed
Initial weight per pig.....pounds..	34.35	34.2	34.85
Final weight per pig.....pounds..	138.11	200.85	196.35
Total gain.....pounds..	984.	1,666.5	1,615.
Average daily gain.....pounds..	.794	1.323	1.282
Feed: corn.....pounds.	3,813.5	5,257.5	5,243.525
tankage.....pounds	.....	503.8	275.975
total concentrates.....pounds	3,813.5	5,761.3	5,519.5
Daily feed per pig: corn.....pounds..	3.078	4.172	4.162
tankage.....ponnds..	....	.400	.219
total concentrates.....pounds..	3.078	4.572	4.381
Concentrates daily per 100 pounds weight.....pounds..	3.569	3.891	3.789
Feed per 100 pounds gain: corn.....pounds..	387.551	315.482	324.677
tankage.....pounds..	.....	30.231	17.088
total concentrates.....pounds.	387.551	345.713	341.765
Parts corn and tankage consumed.....pounds.	....	10.44:1	19:1

The forage plots were expected to furnish sufficient green feed throughout the test but owing to unusually dry weather in July and August Lot I had little forage after September 5 or for the last 4 weeks of the test and Lot III only a small amount after September 19 or for the last 2 weeks. The pigs of Lot II, self-fed corn and tankage ate less clover than those of the other lots and had an abundance at all times.

Allowing tankage with corn to self-fed pigs on clover pasture proved beneficial, resulting in an increase of 66.6 percent in the rate of growth and a concentrate requirement only 89.2 percent as high for each unit of gain produced. The greatest difference in favor of feeding tankage occurred during the early part of the experiment or while the pigs were young. While the difference in gains was not so great, with the records for the two lots receiving tankage summarized to the time when their weekly weights were nearest the same average as that of Lot I at the close of the test, the beneficial effect of adding tankage to the ration in reducing the amount of feed required per unit of gain was even more marked.

Although corn and tankage when self-fed produced gains 3.2 percent more rapidly than when hand-fed, hand-feeding resulted in slightly larger gains from a given amount of feed. A larger proportion of tankage was consumed by the self-fed pigs than was used in the hand-fed ration. Evidently more tankage was taken by the self-fed pigs than was needed to balance the corn consumed.

SELF-FEEDING ON CLOVER

EXPERIMENT VI

In a second self-feeding test on clover pasture conducted the following year three lots of five pigs each were used. Two of these were fed corn and tankage. One was self-fed a mixture of corn, 19; tankage, 1 while the other was allowed the two feeds separately so as to give the pigs an opportunity to take whatever proportion of each they might care for. The third lot was self-fed corn alone. Ground corn was used. Each of the clover plots contained an area of one-fourth of an acre. The pigs were started on the experiment shortly after they were weaned and were fed for a period of 18 weeks with the results shown in Table VIII.

TABLE VIII.—EXPERIMENT VI: Self-Feeding on Clover Pasture

June 13 to October 17, 1917 Five pigs per lot	Corn alone	Corn and tankage separately	Corn, 19: tankage, 1
Initial weight per pig.....pounds.	43.8	42.6	43.5
Final weight per pig.....pounds..	190.4	218.5	227.6
Total gain.....pounds..	733.	879.	809.
Average daily gain.....pounds..	1.163	1.395	1.445
Feed: corn.....pounds..	3,065.	3,375.8	3,122.65
tankage.....pounds..	.....	144.	164.35
total concentrates.....pounds..	3,065.	3,519.8	3,287.
Daily feed per pig: corn.....pounds..	4.865	5.358	5.576
tankage.....pounds..	.....	.229	.294
total concentrates.....pounds..	4.865	5.587	5.870
Concentrates daily per 100 pounds weight.....pounds..	4.155	4.281	4.330
Feed per 100 pounds gain: corn.....pounds..	418.145	384.050	385.989
tankage.....pounds..	.....	16.382	20.315
total concentrates.....pounds..	418.145	400.432	406.304
Parts corn and tankage consumed.....	.....	23.44:1	19:1

As in the preceding experiment rations containing tankage produced more rapid gains and greater gains on a given amount of concentrates than the one in which no tankage was used. The difference in favor of feeding tankage, however, was not as great as it was in the other test.

The pigs having corn and tankage before them in separate compartments of the feeder took an average of only 1 pound of tankage to every 23.4 pounds of corn or less than half as much as was taken by the pigs similarly fed the preceding year and less even

than the 5 percent used in the mixed ration fed the pigs with which they were compared. The average consumption of tankage by those having access to the two feeds separately and those having access to the mixture was twenty-three hundredths and twenty-nine hundredths of a pound daily per head, respectively. The pigs given the mixed ration gained more rapidly but required a slightly larger amount of concentrates per unit of gain.

SELF AND HAND FEEDING ON RAPE PASTURE

EXPERIMENT VII.

An experiment comparing self and hand feeding on rape pasture is reported in Table IX. Four purebred Tamworth pigs and two crossbred pigs out of a Tamworth sow and by a Duroc-Jersey sire were selected for each lot. They ranged from 18 to 20 weeks of age at the beginning of the test. The rape was seeded in rows 24 inches apart at the rate of 3 pounds to the acre 74 days before the time the pigs were turned on the plots. Each plot contained an area of one-half acre.

TABLE IX.—EXPERIMENT VII: Comparison of Self and Hand Feeding on Rape Pasture.

Test was started July 25, 1916 Six pigs per lot	Self-fed corn and tankage separately	Hand-fed corn, 19; tankage, 1
Initial weight per pig.....pounds..	79.2	79.2
Final weight per pig.....pounds..	165.1	161.2
Total gain.....pounds..	515.5	492.5
Average daily gain.....pounds..	1.364	1.066
Feed: corn.....pounds..	1,582.	1,460.150
tankage.....pounds..	296.6	76.850
total concentrates.....pounds..	1,878.6	1,537.
Daily feed per pig: corn.....pounds..	4.185	3.161
tankage.....pounds..	.785	.166
total concentrates.....pounds..	4.970	3.327
Concentrates daily per 100 pounds weight.....pounds..	4.069	2.768
Feed per 100 pounds gain: corn.....pounds..	306.887	296.477
tankage.....pounds..	57.536	5.604
total concentrates.....pounds..	364.423	312.081
Parts corn and tankage.....pounds..	5.33:1	19:1

By self-feeding the pigs were induced to take 42 percent more feed daily per unit of live weight than was consumed by the hand-fed lot. As would be anticipated from this the hand-fed pigs gained more slowly than the self-fed group but ate more forage and required fewer pounds of concentrates for each 100 pounds of gain produced. For some reason the self-fed pigs manifested an abnormal appetite for the tankage and took an excessive quantity of it amounting to 17.5 percent of the total concentrate ration. In the hand-fed mixture only 5 percent of tankage was given. Obviously

the self-fed pigs in this instance ate more tankage than was necessary to produce the maximum gains from a given amount of feed or concentrates, or more than was desirable even from a physiological point of view and regardless of the cost.

EXPERIMENT VIII.

Table X gives the record of the results of a second experiment comparing self and hand feeding on rape pasture. Both lots consisted of five purebred Tamworth pigs which were from 14 to 15 weeks of age at the beginning of the test. Each plot of rape contained a quarter of an acre and furnished an abundance of forage throughout the experiment. The self-fed pigs were allowed free access to corn and tankage placed in separate divisions of the feeder. Shelled corn was fed. A fifth of a pound of tankage daily per head was given the hand-fed pigs. This was fed dry with the corn.

TABLE X.—EXPERIMENT VIII: Comparison of Self and Hand Feeding on Rape Pasture.

Test was started July 16, 1917 Five pigs per lot	Self-fed corn and tankage separately	Hand-fed corn and tankage
Time required to reach a weight of 240 pounds.....days.	105	126
Initial weight per pig.....pounds..	68.8	68.8
Final weight per pig.....pounds..	240.4	239.6
Total gain.....pounds..	858.	854.
Average daily gain.....pounds..	1.634	1.356
Feed: corn.....pounds..	3,043.2	2,997.
tankage.....pounds..	378.2	126.
total concentrates.....pounds..	3,421.4	3,123.
Daily feed per pig: corn.....pounds..	5.797	4.757
tankage.....pounds..	.720	.200
total concentrates.....pounds..	6.517	4.957
Concentrates daily per 100 pounds weight.....pounds..	4.215	3.215
Feed per 100 pounds gain: corn.....pounds..	354.686	350.937
tankage.....pounds..	44.079	14.754
total concentrates.....pounds..	398.765	365.691
Parts corn and tankage.....	8.05:1	23.79:1

The self-fed pigs gained more rapidly and reached a final average weight of 240 pounds in 21 days less time than the hand-fed lot but made fewer pounds of gain on a given amount of concentrates and consumed a much larger proportion of high-priced tankage than was supplied in hand-feeding.

EXPERIMENT IX.

Since in two of the experiments on forage reported in Bulletin 343 the plan of limiting the feed at first and later increasing it to a full-feed proved more satisfactory than hand-feeding a full-feed of concentrates for the entire time it was decided when opportunity permitted to try this plan of feeding in comparison with self-feeding. Accordingly, in 1920, an experiment was conducted with pigs

on rape pasture and fed corn and tankage to compare (1) self-feeding the two feeds separately, (2) self-feeding a mixture of the two, (3) hand-feeding a limited amount at first followed later with a full-feed and (4) hand-feeding a limited allowance of concentrates for the entire time, that is, until the same final weight was reached. Purebred Duroc-Jersey pigs ranging from 12 to 15 weeks of age and averaging 66 pounds in weight at the beginning were used for the experiment. The hand-fed pigs were given 1 pound of tankage to each 19 pounds of corn throughout the test. Until the lot averaged 125 pounds in weight, the mixture given the self-fed pigs consisted of 1 pound of tankage to 14 pounds of corn. From then until the close of the test they were supplied with the same mixture that the hand-fed pigs received. The records for the four lots are presented in Table XI.

TABLE XI.—EXPERIMENT IX: Comparison of Self (Full) Feeding, Limited Feeding and Limited Feeding Followed by Full-Hand Feeding on Forage.

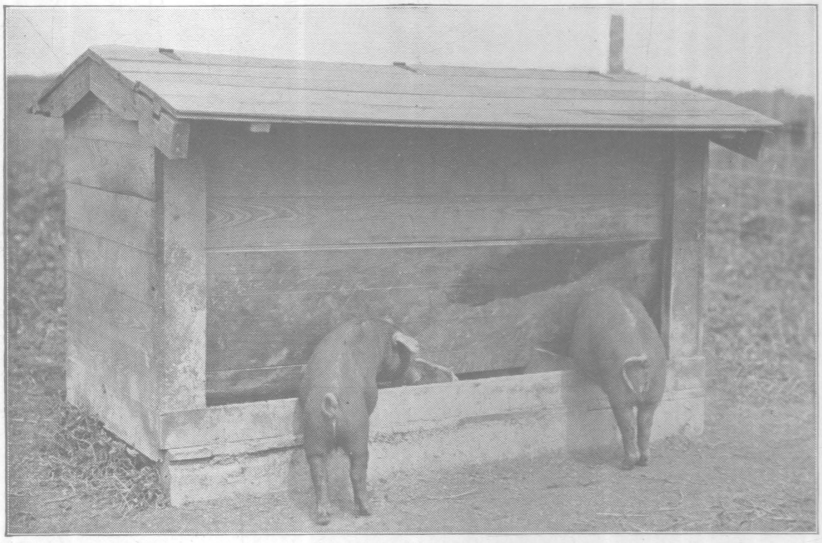
Test was started June 21, 1920	Self-fed corn and tankage separately	Self-fed a mixture of corn and tankage	Hand-fed; limited feed followed by a full feed	Hand-fed; limited feed throughout experiment
Record for lot summarized to	Sept. 20	Sept. 13	Oct. 11	Oct. 25
Pigs, number	6	6	5	5
Time required to gain 160 pounds in weight, days	90	87	116.	133.
Initial weight per pig, pounds	66.25	65.58	65.8	66.5
Final weight per pig, pounds	228.75	220.08	220.4	218.3
Total gain, pounds	975.	927.	773.	759.
Average daily gain, pounds	1.786	1.839	1.380	1.205
Feed: corn, pounds	3,566.	3,243.958	2,384.975	2,247.225
tankage, pounds	236.5	196.542	125.525	118.275
total concentrates, pounds	3,802.5	3,440.5	2,510.5	2,365.500
Daily feed per pig: corn, pounds	6.531	6.436	4.259	3.567
tankage, pounds	.433	.390	.224	.188
total concentrates, pounds	6.964	6.826	4.483	3.755
Concentrates daily per 100 pounds weight, pounds	4.722	4.779	3.133	2.637
Feed per 100 pounds gain: corn, pounds	365.744	349.941	308.535	296.077
tankage, pounds	24.256	21.202	16.239	15.583
total concentrates, pounds	390.000	371.143	324 774	311.660
Parts corn and tankage, pounds	15.08:1	16.50:1	19:1	19:1

In the case of self-feeding, mixing the feeds rather than allowing the pigs to take whatever amounts of the two they might care for resulted in producing gains 2.97 percent more rapidly and in lowering the feed requirement per unit of gain 4.84 percent. The pigs having access to the two feeds separately ate a slightly larger proportion of tankage than the average supplied in the mixture kept before the pigs of the other lot.

The pigs of Lot III were given a limited ration of concentrates until they averaged approximately 125 pounds in weight. After that they were allowed all the feed they would clean up readily

twice daily. For the two periods of 8 weeks they received and took respectively 2.7 pounds and 3.74 pounds of corn and tankage daily for each 100 pounds of live weight. The concentrates supplied Lot IV amounted to an average of 2.64 pounds daily for each 100 pounds of their weight.

Self or heavy feeding, by increasing the rate of gain, has the advantage of enabling the pigs to be marketed earlier and with few exceptions at a higher price. Through shortening the feeding period as a result of the more rapid growth it also reduces the labor, risk, interest and overhead expense. On the other hand, limited feeding has in its favor a lower concentrate requirement per unit, of gain. What plan of feeding to follow will depend to a large extent on the comparative value of concentrates and of pasture as well as on the relative prices at which hogs are likely to sell if marketed early or if marketed later.



Self-fed pigs readily learn their source of feed supply

There is little question but that it will pay to increase the allowance to a full-feed during the latter part of the feeding period if a limited amount of concentrates is fed at first. With hogs figured at the same value per 100 pounds it would be advisable as a rule to feed a limited ration at first and a full-feed later in preference to self-feeding or giving the pigs a full-feed for the entire time but taking into consideration the probable lower selling price of the more slowly-growing pigs conditions might sometimes exist under

which full or self-feeding from the first would be preferable. The average monthly prices of hogs on the Chicago market for the 15 years from 1906 to 1920 inclusive were 7, 11.6 and 14.4 percent lower respectively for October, November and December than for September[1].

SUMMARY OF SELF AND HAND FEEDING EXPERIMENTS ON FORAGE

Table XII gives the average results obtained from self-feeding corn and tankage to ten different groups or a total of 67 pigs which in addition to the concentrates received forage of some kind and shows also the average results secured from hand-feeding rations of corn and tankage to 165 head of pigs on forage fed in 24 different groups. The summary for the hand-fed pigs includes only the data of lots that were fed for a period of 11 weeks or longer and that were given 3.5 pounds of feed or more daily for each 100 pounds of their weight.

TABLE XII.—General Summary of Self and Hand Feeding on Forage.

	Self-fed corn and tankage	Hand-fed corn and tankage
Number of lots	10	24
Number of pigs	67*	165†
Initial weight per pig....pounds..	55.6	55.5
Final weight per pig....pounds..	207.8	201.7
Total gain....pounds..	10,046.5	23,612.50
Average daily gain....pounds..	1.497	1.287
Feed consumed: corn....pounds..	34,167.108	79,856.576
tankage....pounds..	2,801.992	5,035.574
total concentrates....pounds..	36,969.100	84 892.15
Daily feed per pig: corn....pounds..	5.091	4.352
tankage....pounds..	.418	.275
total concentrates....pounds..	5.509	4.627
Concentrates daily per 100 pounds weight....pounds..	4.183	3.613
Feed per 100 pounds gain: corn....pounds..	340.090	338.196
tankage....pounds..	27.890	21.326
total concentrates....pounds..	367.980	359.522
Parts corn and tankage	12.19:1	15.86:1

*Two pigs taken out during the experiments. †Five pigs taken out during the experiments.

Self-feeding on forage produced gains 16.3 percent more rapidly on the average than hand-feeding. With pigs carried from weaning time to a weight of from 200 to 215 pounds this would mean a saving in time of approximately 3 weeks. The self-fed pigs ate 1 pound of tankage for every 12.2 pounds of corn consumed which was a somewhat larger proportion than the average allowed the hand-fed lots. With the tankage valued twice as high as an

[1]Based on statistics from the "Year Book of Figures" for 1920, published by the Chicago Daily Drovers Journal.

equal weight of corn the hand-fed pigs ate 96.2 percent as much corn or its equivalent in tankage for each unit of gain produced as did those that were self-fed.

In the experiments directly comparing self and hand feeding on forage a much smaller average proportion of tankage was supplied in the hand-fed rations than was consumed by the pigs permitted to take whatever proportions of feed they might care for. A summary of these trials shows that the self-fed pigs gained 15.8 percent more rapidly than the hand-fed pigs with which they were compared but that in the case of hand-feeding, if each pound of tankage is considered equal in value to 2 pounds of corn, only 91.8 percent as much corn plus its equivalent in tankage was required for each unit of gain produced.

Pigs soon make hogs of themselves when self-fed

Since pigs which have access to concentrate feeds at all times are inclined to eat these rather than exert themselves much in procuring green feed, self-fed pigs utilize less forage than hand-fed pigs even though the latter are fed all the concentrates they will clean up readily twice daily. Hence it is only natural that the difference in the gains produced from a given amount of concentrates in favor of hand-feeding over self-feeding should be slightly greater when the pigs were on forage than was the case in dry-lot feeding.

PROPORTIONS OF CORN AND TANKAGE TAKEN BY SELF FED PIGS

A study of the records of the various individual tests in which the two feeds were self-fed separately discloses a wide variation in the proportions of corn and tankage consumed by the different groups of pigs when they were of the same weight and shows, too, that the proportions taken by the same lot also often varied widely from week to week. There seemed to be considerable irregularity in the demands of the appetite. One noticeable feature, however, was that practically always the proportion of tankage consumed decreased as the pigs became heavier.

Table XIII gives the daily feed consumption per head, the average proportions of corn and tankage taken and the percentages of tankage consumed by pigs at different weights in experiments in which the two feeds were self-fed separately.

TABLE XIII.—Feed Consumed and Proportions Taken by Pigs of Different Weights Self-Fed Corn and Tankage.

Weight of pigs	Number of groups	Number of pigs	Daily feed per pig			Proportion of corn to tankage	Tankage in ration
			corn	tankage	total		
In dry lot							
			Pounds	*Pounds*	*Pounds*	*Parts*	*Percent*
Under 50 pounds..	5	24	2.26	.45	2.71	5.07:1	16.5
50 to 100 pounds..	12	63	3.48	.57	4.05	6.07:1	14.1
100 to 150 pounds..	14	71	5.44	.52	5.96	10.46:1	8.7
150 to 200 pounds..	12	62	6.78	.40	7.18	16.82:1	5.6
200 to 250 pounds.	8	40	7.57	.30	7.87	24.69:1	3.9
Over 250 pounds...	1	4	6.75	.20	6.95	34.36:1	2.8
Total average...	.....	.....	5.21	.48	5.69	10.86:1	8.4
On forage							
Under 50 pounds..	3	25	2.48	.30	2.78	8.31:1	10.7
50 to 100 pounds...	8	56	3.78	.37	4.15	10.11:1	9.0
100 to 150 pounds..	8	56	4.92	.53	5.45	9.38:1	9.6
150 to 200 pounds..	8	56	6.79	.46	7.25	14.78:1	6.3
200 to 250 pounds..	5	33	7.56	.36	7.92	21.02:1	4.5
Over 250 pounds...	1	6	9.08	.32	9.40	28.39:1	3.4
Total average...	.....	.....	5.10	.43	5.53	11.80:1	7.8

The average amount of tankage consumed daily per head by the pigs on forage increased until the pigs weighed between 100 and 150 pounds and then decreased for each 50-pound interval thereafter. In dry-lot feeding, although there was not a great deal of difference in the average amounts consumed by the pigs for the 50 to 100 and for the 100 to 150 pound intervals the daily consumption of tankage per head was greater while the pigs were between 50 and 100 pounds in weight than it was at any other time. After a

weight of 100 pounds was reached, they ate less tankage a head daily during each interval as they became heavier. With but a single exception the percentage of supplement in the rations selected by the pigs decreased as they increased in weight. A slightly larger average percentage of tankage was taken by the pigs in dry lot than was consumed by those on forage. This was due to a greater consumption by the former while they were small as later or at the heavier weights those on forage took a higher percentage of tankage than did those in dry lot.

COMPARISON OF SUPPLEMENTS TO CORN WHEN SELF FED

EXPERIMENT X.

Experiment X was conducted for the purpose of comparing various supplements to corn when these and the corn were self-fed separately. The pigs used were purebred Duroc-Jerseys ranging from 80 to 96 days of age and averaging 54 pounds in weight at the beginning of the test. In addition to the corn and supplement each lot had access to salt, ground limestone and ground rock phosphate kept before them in separate containers. During the experiment the pigs were confined in pens of a central house floored with concrete. Table XIV shows the results from feeding ground soybeans, linseed meal and tankage as the supplemental feeds in this manner with the record for each lot summarized to the time when its weekly weight was nearest an average of 170 pounds, the approximate weight of the soybean lot at the close of the experiment.

TABLE XIV.—EXPERIMENT X: Comparison of Supplements for Self-feeding.

Test was started December 20, 1916 Six pigs per lot	Corn and ground soybeans	Corn and linseed meal	Corn and tankage
Time required.....days..	98	91	77
Initial weight per pig.....pounds..	54.17	54.25	53.5
Final weight per pig.....pounds.	168.83	171.83	174.5
Total gain.....pounds..	688.	705.5	726.
Average daily gain.....pounds..	1.170	1.292	1.571
Feed consumed: corn.....pounds..	2,931.	2,930.	2,482.5
supplement.....pounds..	113.5	116.	202.5
total.....pounds..	3,044.5	3,046.	2,685.
Daily feed per pig: corn.....pounds..	4.985	5.366	5.374
supplement.....pounds..	.193	.213	.438
total.....pounds..	5.178	5.579	5.812
Daily feed per 100 pounds weight.....pounds..	4.644	4.935	5.098
Feed per 100 pounds gain: corn.....pounds..	426.018	415.308	341.942
supplement.....pounds..	16.497	16.442	27.893
total.....pounds..	442.515	431.750	369.835
Parts corn and supplement.....pounds..	25.8:1	25.3:1	12.3:1

The soybeans and linseed meal proved to be distasteful and the pigs failed to take sufficient quantities of these supplements to balance the corn. The proportions consumed were much smaller than

is recommended for hand-feeding and amounted to less than 4 per-cent of the total rations. An average of 1 pound of tankage to every 12.3 pounds of corn was consumed by the pigs allowed these feeds. This is a smaller proportion of tankage than is sometimes recommended in hand-feeding but was sufficient to produce rapid and economical gains.

A second experiment (See Experiment 4, Bulletin 349) in which the same supplemantal feeds were used and fed in a similar manner gave like results except that still smaller relative amounts of soybeans and of linseed meal were taken. The pigs allowed corn and tankage ate 1 part of tankage for each 10.4 parts of corn, gained at the rate of 1.3 pounds daily and consumed an average of 393.35 pounds of feed per 100 pounds of gain produced. Those given soybeans as the supplement ate but 1 pound of beans to every 52.3 pounds of corn and as a consequence made an average daily gain of only .6 of a pound and required the excessive amount of 538.33 pounds of feed per 100 pounds of gain. The pigs allowed linseed meal did a little less poorly. They ate 1 part of the meal to every 34.2 parts of corn, gained .78 of a pound daily a head and consumed 511.17 pounds of feed for each 100 pounds of increase in live weight.

SELF-FEEDING MIXED RATIONS AND THE SAME FEEDS SEPARATELY

CORN AND LINSEED MEAL.

EXPERIMENT XI.

Since, in tests comparing supplements to corn when they were self-fed, the pigs ate such small quantities of the nitrogenous feeds if they happened to be distasteful, Experiment XI was conducted to determine whether better results would be secured by feeding a mixture of corn and an unpalatable supplement and thus compelling the pigs to take a larger proportion of the supplemental feed than would be taken if the same feeds were self-fed separately. Linseed meal was the supplement tried. Ten crossbred pigs from Tamworth sows and by a Duroc-Jersey sire were divided into two lots and used in the test. One group was allowed ground corn and linseed meal in separate compartments of the feeder while the other was given access to a mixture of ground corn, 6; linseed meal, 1. The test was continued for 49 days with the results shown in Table XV.

The pigs fed the mixture ate a larger total amount of feed daily per head, ate more feed daily per unit of weight, gained 26.35

percent more rapidly and required 8.05 percent less feed for each 100 pounds of gain produced than those offered the corn and linseed meal separately. Those given the opportunity to choose the proportions of the two feeds for themselves took only 1 part of linseed meal to 25.8 parts of corn. If the results are summarized to the same final weight the difference in favor of self-feeding the mixture is found to be even greater.

TABLE XV.—EXPERIMENT XI: Self-Feeding Corn and Linseed Meal; Separately and Mixed.

September 25 to November 13, 1918 Five pigs per lot	Corn and linseed meal self-fed separately	Corn, 6; linseed meal, 1; self-fed
Initial weight per pig.....pounds	121.5	119.8
Final weight per pig.....pounds.	204.6	224.8
Total gain.....pounds.	415.5	525.
Average daily gain.....pounds..	1.696	2.143
Feed consumed: corn.....pounds.	1,721.7	1,780.971
linseed meal.....pounds..	66.7	296.829
total.....pounds.	1,788.4	2,077.800
Daily feed per pig: corn.....pounds.	7.028	7.269
linseed meal.....pounds..	.272	1.212
total.....pounds.	7.300	8.481
Daily feed per 100 pounds weight.....pounds.	4.477	4.922
Feed per 100 pounds gain: corn.....pounds.	414.368	339.232
linseed meal.....pounds..	16.053	56.539
total.....pounds.	430.421	395.771
Parts corn and linseed meal.....pounds .	25.8:1	6:1

EXPERIMENT XII.

For the purpose of securing further data on self-feeding corn and linseed meal separately and self-feeding a mixture of the two feeds, as well as studying the effect of adding some tankage to the linseed meal and self-feeding this mixture in one compartment of the feeder and corn in another, Experiment XII was planned. Crossbred pigs from Duroc-Jersey sows and by a Tamworth sire were used in the experiment. At the time the test was begun they were from 101 to 109 days of age and averaged 65 pounds in weight. During the trial they were kept in pens of a central house where they could get nothing other than what was given them. Twice weekly they were allowed a small amount of salt.

In Table XVI the records of the three lots for the first and second 7-week intervals, respectively, and for the combined period of 14 weeks are presented. The mixture of corn and linseed meal used consisted of 8 parts of corn to 1 of linseed meal. As will be noted from a study of the results this proved to be an insufficient amount. At first very little linseed meal was taken by the pigs having access to it and corn separately. After a number of weeks,

TABLE XVI.—EXPERIMENT XII: Self-Feeding Linseed Meal Separately; Mixed with Corn and Mixed with Tankage.

Five pigs per lot	December 19 to February 6			Feb. 6 to March 26			December 19, 1919 to March 26, 1920		
	Corn and linseed meal self-fed separately	Corn self-fed; linseed meal 2; tankage, 1; self-fed	Mixture of corn 8; linseed meal, 1; self-fed	Corn and linseed meal self-fed separately	Corn, self-fed; linseed meal, 2; tankage, 1; self-fed	Mixture of corn, 8; linseed meal, 1; self-fed	Corn and linseed meal self-fed separately	Corn self-fed; linseed meal, 2; tankage, 1; self-fed	Mixture of corn, 8; linseed meal, 1; self-fed
Initial weight per pig....pounds..	63.5	62.8	63.1	91.5	127.3	101 3	63.5	62.8	63.1
Final weight per pig....pounds..	91.5	127.3	101.3	143.1	198.6	136.7	143.1	198.6	136.7
Total gain....pounds..	140.	322.5	191.	258.	356.5	177.	398.	679.	368.
Average daily gain....pounds..	.571	1.316	.780	1.053	1.455	.722	.812	1.386	.751
Feed consumed: corn....pounds..	707.5	1,024.	849.333	954.5	1,393.	804.178	1,662.	2,417.	1,653.511
linseed meal....pounds..	52.	152.667	106.167	204.5	103.867	100.522	256.5	256.533	206.689
tankage....pounds..	.....	76.333	.....	.....	51.933	.....	.....	128.267	.....
total....pounds..	759.5	1,253.	955.5	1,159.	1,548.8	904.7	1,918.5	2,801.8	1,860.2
Daily feed per pig: corn....pounds..	2.888	4.180	3.467	3.896	5.686	3.283	3.392	4.933	3.374
linseed meal....pounds..	.212	.623	.433	.835	.424	.410	.523	.523	.422
tankage....pounds..	.....	.311	.....	.....	.212	.....	.....	.262	.....
total....pounds..	3.100	5.114	3.900	4.731	6.322	3.693	3.915	5.718	3.796
Daily feed per 100 pounds weight....pounds..	4.000	5.381	4.745	4.033	3.879	3.103	3.790	4.375	3.800
Feed per 100 pounds gain: corn....pounds..	505.357	317.519	444.677	369.961	390.743	454.338	417.588	355.965	449.324
linseed meal....pounds..	37.143	47.339	55.585	79.264	29.135	56.792	64.447	37.781	56.165
tankage....pounds..	.....	23.669	.....	.....	14.568	.....	.....	18.890	.....
total....pounds..	542.500	388.527	500.262	449.225	434.446	511.130	482.035	412.636	504.489
Parts corn and supplement....	13.6:1	13.4:2:1	8:1	4.7:1	26.8:2:1	8:1	6.5:1	18.8:2:1	8:1

however, they began to eat it more readily and during the second interval consumed a larger proportion than was used in the mixture. Of the two lots for both periods the rate and economy of growth were in favor of the pigs that ate the largest relative amount of linseed meal. Using tankage with the linseed meal proved beneficial both in producing more rapid gains and in lowering the feed requirement per unit of increase in live weight.

EXPERIMENT XIII.

The results of an experiment making a third comparison of self-feeding a mixture of corn and linseed meal and of self-feeding the two feeds separately are reported in Table XVII in which a summary for each lot to the time its weekly weight was nearest an average of 245 pounds a head is given. Purebred Tamworth pigs from 30 to 33 weeks of age and averaging 148.8 pounds in weight at the beginning of the experiment were used. The mixed ration supplied was made up of 5.5 pounds of corn to each pound of linseed meal.

TABLE XVII.—EXPERIMENT XIII: Self-Feeding Corn and Linseed Meal; Separately and Mixed.

Test was started May 28, 1920 Four pigs per lot	Corn and linseed meal self-fed separately	Mixture of corn, 5.5; linseed meal, 1; self-fed
Time required to gain 95 pounds in weight.....days.	69	57
Initial weight per pig.....pounds.	148.9	148.7
Final weight per pig.....pounds.	245.6	242.1
Total gain.....pounds..	387.	373.5
Average daily gain.....pounds..	1.382	1.667
Feed consumed: corn.....pounds..	2,232.	1,723.192
linseed meal.....pounds..	88.5	313.308
total.....pounds.	2,320.5	2,036.5
Daily feed per pig: corn.....pounds..	7.971	7.693
linseed meal.....pounds..	.316	1.399
total.....pounds..	8.287	9.092
Daily feed per 100 pounds weight.....pounds.	4.202	4.652
Feed per 100 pounds gain: corn.....pounds .	576.744	461.363
linseed meal.....pounds..	22.868	33.884
total.....pounds..	599.612	545 248
Parts corn and linseed meal.....	25.2:1	5.5:1

During the early part of the test the lot having access to the two feeds separately ate very little linseed meal. For 5 weeks averages ranging from no linseed meal at all 1 week to 3.36 percent of the total feed consumed another were taken. Later the pigs began eating the meal a little more freely. During the last half of the experiment the linseed meal consumed each week ranged from 6.7 to 7.6 percent of the total weekly consumption of feed. As compared with self-feeding them separately, feeding the corn

and linseed meal mixed in the proportions of 5.5:1 produced more rapid gains and reduced the amount of feed required for each 100 pounds of increase in live weight.

Satisfaction comes with an appeased appetite

The experiments reported show that when an unpalatable protein feed is used with corn and self-fed in a manner which will allow the pigs to take whatever proportion of each feed they may care for they sometimes take less of the supplemental feed than is needed to produce the optimum results possible from the feeds before them.

HOMINY FEED AND TANKAGE

In an experiment in which hominy feed was compared with corn and in which tankage was used as the supplemental feed and self-fed separately, the pigs receiving it took only 4.9 pounds of the hominy feed for each pound of tankage consumed, or a much larger proportion of the tankage than is usually given in hand-feeding. The lot having access to hominy feed ate only 87.4 percent as much feed daily per unit of weight as those receiving corn and gained only 84.8 percent as rapidly. Possibly because of their greater consumption of tankage, they consumed 4.25 percent less of total feed for each unit of increase in live weight than did the corn-fed pigs. Nevertheless, with the relative prices which ordinarily prevail, their gains, due to the large amount of tankage taken, were more costly and the returns were smaller than were those from the corn-fed pigs. Mixing the carbonaceous and nitrogenous feeds before placing them in the feeder would have made it impossible for the pigs to have taken an excessive amount of the high-priced supplement.

EXPERIMENT XIV.

Experiment XIV was conducted for the purpose of comparing self-feeding hominy feed and tankage separately and self-feeding the same two feeds mixed in definite proportions. The pigs used were crossbreds from Tamworth sows and by a Duroc-Jersey sire. With the exception of one that was somewhat younger they were from 101 to 107 days of age and averaged 72.75 pounds in weight when the experiment was started. During the test each lot was kept on a quarter of an acre of rape pasture which furnished an abundance of forage. Since a new supply of hominy feed was not obtained in time it was necessary to close the experiment on the sixty-eighth day when that on hand was exhausted. The record given in Table XVIII for the group having access to the two feeds separately is a summary of their performance to the close of the test while that for the lot having the mixture before them is to the time when their weekly weight was nearest the weight of the others at the close of the experiment.

TABLE XVIII.—EXPERIMENT: Self-Feeding Hominy Feed and Tankage; Separately and Mixed.

Test was started August 11, 1920 Four pigs per lot	Hominy feed and tankage self-fed separately	Hominy feed, 12; tankage, 1, self-fed
Time required to gain 90 pounds in weight .....days..	72	62
Initial weight per pig.....pounds.	72.7	72.7
Final weight per pig.....pounds.	157.9	164.
Total gain.....pounds..	340.5	365.
Average daily gain.....pounds..	1.252	1.448
Feed consumed: hominy feed.....pounds..	1,274.6	1,465.385
tankage.....pounds.	169.	122.115
total concentrates.....pounds..	1,443.6	1,587.5
Daily feed per pig: hominy feed.....pounds..	4.686	5.815
tankage.....pounds..	.621	.485
total concentrates.....pounds..	5.307	6.300
Daily concentrates per 100 pounds weight.....pounds..	4.603	5.322
Feed per 100 pounds gain: hominy feed.....pounds..	374.332	401.475
tankage.....pounds..	49.633	33.456
total concentrates.....pounds..	423.965	434.932
Parts hominy feed and tankage.....pounds..	7.54:1	12:1

The pigs receiving the mixture ate a larger amount of feed daily per unit of weight and gained 15.7 percent more rapidly than did those which were permitted to take whatever proportions of the two feeds they cared for. The latter ate 1 pound of tankage for every 7.54 pounds of hominy feed consumed as compared with 1 pound of tankage to 12 pounds of hominy feed supplied in the mixture. Although the pigs receiving the mixed ration ate more feed for each unit of increase in live weight, with the tankage valued twice as high as an equal weight of hominy feed, they consumed 468.4 pounds of hominy feed or its equivalent in cost for each 100

pounds of gain produced as compared with a requirement of 473.6 pounds of hominy feed or its equivalent in cost consumed by the pigs having access to the two feeds separately.

BARLEY AND TANKAGE

EXPERIMENT XV.

The pigs used in Experiment XV, the plan of feeding followed and the conditions under which the feeding was done were similar to those of Experiment XIV. In Experiment XV, ground barley and tankage were fed and the pigs were carried to heavier weights than were those used in Experiment XIV. The record for each group, to the time their weekly weight was nearest an average of 215 pounds, is given in Table XIX.

TABLE XIX.—EXPERIMENT XV: Self-Feeding Barley and Tankage; Separately and Mixed.

Test was started August 11, 1920 Four pigs per lot	Barley and tankage self-fed separately	Mixture of barley, 14; tankage, 1; self-fed
Time required..... days..	84	77
Initial weight per pig ..... pounds..	72.6	72.1
Final weight per pig. ..... pounds..	215.9	214.7
Total gain..... pounds..	573.	570.5
Average daily gain..... pounds..	1.70b	1.852
Feed consumed: ground barley..... pounds..	2,567.5	2,375.333
tankage..... pounds..	283.	169.667
total concentrates..... pounds..	2,850.5	2,545.
Daily feed per pig: barley..... pounds..	7.641	7.712
tankage.. ..... pounds..	.842	.551
total concentrates..... pounds..	8.483	8.263
Daily concentrates per 100 pounds weight..... pounds..	5.881	5.761
Feed per 100 pounds gain: barley..... pounds..	448.080	416.360
tankage..... pounds..	49.389	29.740
total concentrates ..... pounds..	497.469	446.100
Parts barley and tankage.....	9.07:1	14:1

Although they ate slightly more feed daily per unit of weight, the pigs having access to barley and tankage in separate compartments of the feeder gained more slowly and required more feed for each unit of gain than those self-fed a mixture of the same feeds. The mixture used was made up of 1 part of tankage to 14 parts of ground barley by weight. One pound of tankage to every 9.07 pounds of barley consumed was taken by the pigs allowed whatever amounts of the two feeds they desired.

Evidently the appetite or instinct of an animal does not always enable it to select the feeds before it in the proportions which will most nearly meet its needs, as manifested by rapidity of gains and the growth produced from a given amount of feed. Besides showing a tendency, when having access to the feeds in separate com-

partments of a feeder, to take an insufficient amount of the high-protein feed if it happens to be distasteful and is fed with a palatable carbonaceous feed, pigs also show an inclination to consume too large a proportion of the nitrogenous feed if it proves to be palatable and the carbonaceous feed is one of which they are not particularly fond.

OBSERVATIONS ON SELF-FEEDING; SAVING OF LABOR

While ear corn is sometimes self-fed it is not as satisfactory for self-feeding as shelled or ground corn. The results of a large number of investigations show no advantage in either the rate or economy of gains from feeding dry shelled corn over feeding ear corn. With pigs under 150 pounds in weight ear corn as a rule gives as rapid and economical gains as ground corn fed wet or soaked. Moistened or soaked ground corn, however, fed to pigs weighing more than 150 pounds produces somewhat more rapid gains on 4 to 6 percent less feed for each unit of gain than ear corn or dry shelled corn.[1] According to Rommel the difference in favor of wetting or soaking the feed over feeding it dry is approximately 2 percent[2] and if such is the case not all of the difference noted above would be due to the grinding but a part of it would be the result of wetting or soaking the feed. It will be seen then that, without any material benefit from the operation within itself for a greater part of the feeding period at least, self-feeding as commonly practiced necessitates the additional labor and expense over hand-feeding of shelling or of both shelling and grinding the corn.

The labor saved by self-feeding is influenced to a certain extent by the size of the feeder. A small feeder that requires refilling every few days does not save as much labor as one that will hold sufficient feed for a considerable length of time.

Besides the labor involved in refilling from time to time self-feeders require frequent attention and should be inspected at least once each day. The feeder should be watched to see that no feed is being nosed out of the troughs and wasted and that the feed has not clogged in the hoppers. If they are fed separately it is necessary to observe whether the supply of any of the various feeds has been exhausted and to ascertain whether approximately the correct proportions of the protein and carbonaceous feeds are being consumed.

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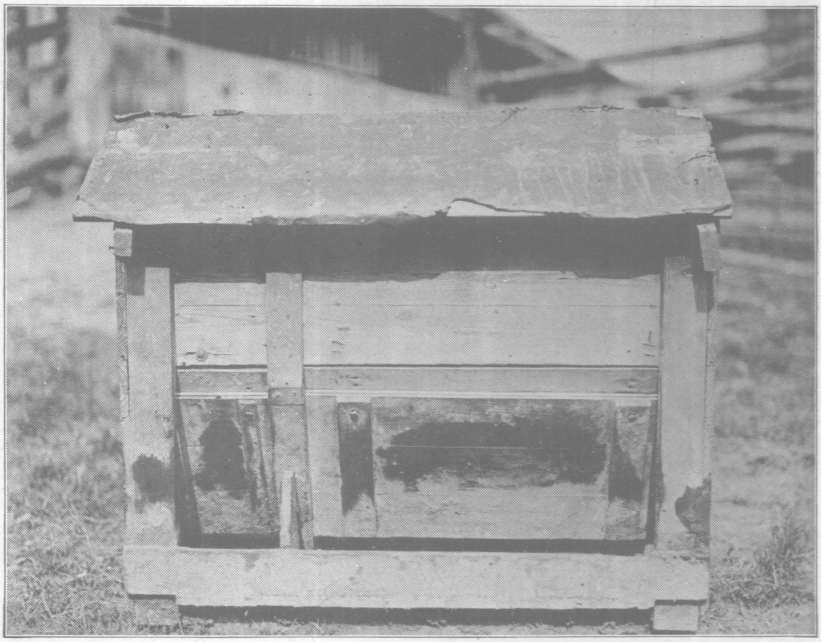
[1]Henry and Morrison's, "Feeds and Feeding", p. 567
[2]United States Department Agriculture, Bureau Animal Industry, Bulletin 47.

When everything is taken into consideration it is doubtful whether much labor is saved by self-feeding. Obviously the amount of labor saved is not as great as it might appear to one who is unfamiliar with self-feeding or as superficial thought might at first lead one to believe.

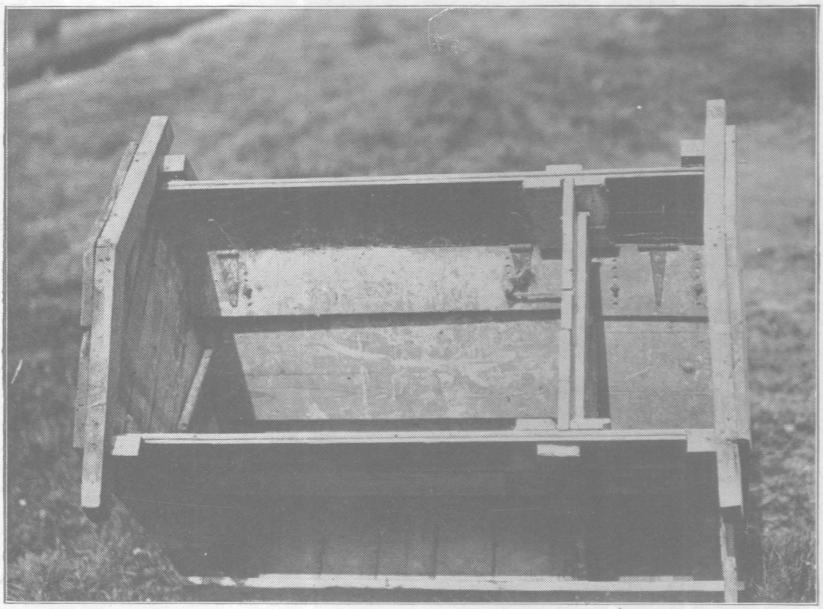
ADAPTABILITY

When self-feeding is practiced pigs cannot be carried to as heavy a weight as they can if they are developed more slowly. The weight at which they become so fat that the feed required for any further increase in weight is excessive is influenced largely by the type of hogs kept. While pigs of the large, stretchy, upstanding, rangy type possessing considerable length seldom cease to make economical gains until a marketable weight is attained even when they are self-fed from the time they are weaned, those of the small, short, chuffy type with a propensity to fatten at a light weight and an early age often become so highly finished before the 200-pound weight is reached that any further slight increases in weight they make are extremely costly.



A type of home-made feeder used in a number of tests at the Ohio Experiment Station

In a general way self-feeding is not adapted to the feeding of animals being developed for breeding purposes or to the feeding of the mature breeding herd. There is considerable danger of young self-fed animals breaking down in the pasterns and a likelihood of their becoming so fat that their usefulness for breeding will be impaired. Such animals should be well-grown but not permitted to carry a surplus of fat. The skillful feeder may possibly be able to develop breeding stock successfully by self-feeding a properly combined mixture containing a liberal amount of fibrous material but the same degree of success can be attained with much less difficulty by hand-feeding and limiting the concentrate ration to the amount needed to keep the animal in good growing condition but not fat. Although minerals and a leguminous hay may well be self-fed to the breeding, herd self-feeding the grain or concentrates is not advisable. The adaptability of self-feeding is largely one of the desirability of extremely heavy feeding.



Showing construction of home-made feeder; cover removed

Since they have an opportunity at the feed after the larger and more aggressive ones have satisfied their appetites and left, if it is necessary to keep fattening swine of various sizes together, the smaller pigs are likely to fare better under the self-feeding scheme than they do when trough-feeding is practiced, and particularly so

should the trough space be limited to such an extent that the stronger animals are enabled to crowd out the weaker ones and gorge most of the feed. In hand-feeding pigs of different sizes together the smaller ones stand a better chance of getting their share if ear corn is used.

SUMMARY AND DEDUCTIONS

Self-fed pigs in dry lot usually ate a larger amount of feed daily per unit of live weight than similar hand-fed pigs kept under like conditions.

The higher feed consumption induced by self-feeding resulted in more rapid gains than were obtained from hand-feeding. The extent of the difference in the rate of growth in favor of self-feeding doubtless will vary with the ability of the feeder and will depend very largely on the quantity of feed he is capable of getting hand-fed pigs to consume.

A compensating feature for hand-feeding was that even under dry lot conditions slightly greater gains were produced from a given amount of feed.

Pigs self-fed corn and tankage in dry lot took a slightly smaller proportion of tankage on the average than was allowed the hand-fed pigs with which they were compared and less than is usually recommended for pigs which have no forage.

For pigs on forage that are self-fed, some high protein concentrate with the grain or carbonaceous feed is essential for best results.

A minimum of forage is utilized when self-feeding is practiced.

When corn and tankage were self-fed to pigs on forage they sometimes took more tankage than was needed to balance the ration and thus increased the cost of production without increasing the rate of growth or reducing the feed consumption per unit of gain.

Like the relative results obtained from the two methods of feeding in dry lot, self-fed pigs on forage consumed a larger amount of concentrates per unit of weight and gained more rapidly than the hand-fed pigs with which they were compared. The difference in the quantity of concentrates consumed for each unit of gain produced in favor of hand-feeding was greater than it was in the case of dry-lot feeding. Since hand-fed pigs eat more forage than self-fed pigs this is in accord with what would be expected.

Pigs fed a limited ration at first and hand-fed a full-feed later did not gain as rapidly but made greater gains from a given amount of concentrates than did similar pigs that were self-fed. Price conditions sometimes exist under which this method of feeding would be preferable to self-feeding.

Through bringing about a greater utilization of green feed, as compared with self-feeding, limited feeding or the feeding of a light ration of grain in connection with forage not only reduced the percentage of high-priced nitrogenous concentrate needed in the ration but also resulted in a marked reduction in the amount of concentrates required for each unit of gain produced.

When corn and tankage were self-fed separately so that the pigs could consume whatever proportions of each they cared for they took a high percentage of tankage while young. The percentage of supplement in the ration selected then decreased as the pigs became older or increased in weight.

In each of two experiments the supplemental feeds taken by pigs self-fed corn and ground soybeans and others self-fed corn and linseed meal separately amounted to less than 4 percent of the total rations, a much smaller quantity than is needed to balance the corn.

When a sufficient amount of linseed meal to meet the protein requirements of the animal body was mixed with the corn, self-feeding a mixture of the two feeds gave better results than self-feeding the same feeds separately.

Based on the findings of a test comparing the two, a mixture of tankage and linseed meal was more palatable than linseed meal alone. A summary of the results to the same final weight shows that the percentage of protein in the feed consumed by pigs having access to such a mixture and to corn was higher than the percentage of protein supplied by corn and linseed meal when taken in the proportions selected by pigs having access to these two feeds separately.

Although without exception they ate little or no linseed meal at first, in some instances pigs which had access to linseed meal in one compartment of the feeder and corn in another learned to eat the linseed meal a little more readily as the experiment progressed, indicating either that it became less distasteful after they had become somewhat accustomed to it or that there was some tendency for the pigs to attempt to balance their own ration even with distasteful feeds.

While pigs self-fed hominy feed and tankage separately required 2.5 percent less of total feed for each unit of gain produced

than others in comparison self-fed a mixture of the two feeds, they gained only 86.5 percent as rapidly and, since they consumed a considerably higher percentage of tankage than was supplied in the mixture, if it is valued at twice as much as an equal weight of corn, they also made more costly gains.

When both rations were self-fed more rapid growth and a greater increase in live weight from a given amount of feed were secured from the use of a mixture of barley and tankage than were obtained by allowing access to the two feeds separately. The ration selected by the pigs contained 3.26 percent more tankage than was supplied in the mixture.

When given an opportunity to choose whatever proportions of the feeds they cared for, pigs not only showed an inclination to take an insufficient amount of the nitrogenous feed if it proved to be distasteful and was fed with a palatable carbonaceous feed, but also showed a tendency to consume a larger amount of the high-protein feed than was needed when the carbohydrate feed offered was less palatable than the supplement used.

Instinct does not always enable an animal to select the proper proportions of the feeds available to give the optimum results possible from those particular feeds.

There is little question of the fallibility of the appetite of swine in enabling them to choose the feed stuffs or to select the proper proportions of the particular feeds before them to most nearly meet their physiological needs. Rations can be mixed which usually will give better results than are obtained from allowing the pigs access to the same feeds separately. Nevertheless the element of selection is worth taking advantage of as a careful study of the likes and dislikes of swine and of their idiosyncrasies of taste as revealed through self-feeding experiments is valuable in obtaining suggestions concerning the formulation of rations and the more efficient utilization of various feed stuffs.